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United States
Department of
Agriculture

Forest Service

Pacific
Northwest
Region

**Wallowa-Whitman
National Forest**

**Blue Mountains Pest
Management Zone**

BMZ-99-03
December 3, 1998

Whitebark Pine Health in Northeastern Oregon and Western Idaho

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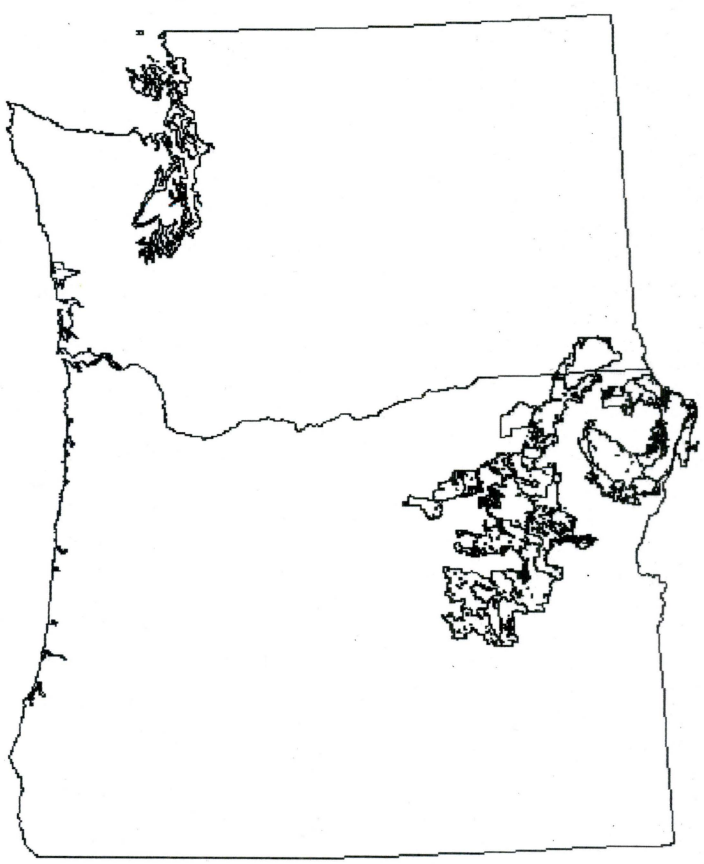

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Reply to: 3420

Date: December 3, 1998
Report: BMZ-99-03

Subject: Whitebark Pine Health in Northeastern Oregon and western Idaho

To: Forest Supervisors, Umatilla, Malheur, and Wallowa-Whitman NF's

During the weeks of September 8 and 15, and on September 26, 1997, we visited a number of sites in northeastern Oregon and western Idaho to conduct an area-wide informal survey of whitebark pine stand health. This survey was initially proposed by Charlie Johnson, Area Ecologist. We met with Charlie prior to the field visits to secure maps indicating locations of ecological classification plots he'd located over the years in accessible stands containing whitebark pine. We felt this would likely offer the most efficient method of identifying known whitebark communities in the short amount of time that we had. This survey should be considered a preliminary sample of whitebark pine stands in this area to determine the occurrence of insects and diseases, and some rough relative severity levels. A more detailed formal survey with standardized sampling regime would give statistically valid information, and may be needed after this initial investigation has documented the forest health concerns for these high elevation communities.

Procedures used in this survey were stand walkthrough examinations to determine stand structure and composition, confirm causes of mortality, approximate levels of disease infestation, stand history and history of mortality, and occurrence of *Ribes spp.* in or near communities with whitebark pine. We attempted to look at a enough trees over a large enough area that we could ascertain the stand conditions and the active insect and disease agents in the area.

Whitebark Pine in the Blue Mountain and Wallowa-Snake Province--An Overview

In this area, whitebark pine is restricted to high elevation forested plant associations throughout the Blue, Wallowa, Elkhorn, Strawberry, and Seven Devil Mountains (Johnson and Clausnitzer 1992; Johnson and Simon 1987). Those plant associations

which have whitebark pine include:

- subalpine fir/elksedge
- subalpine fir/needlegrass
- subalpine fir-whitebark pine/fleeceflower
- subalpine fir-whitebark pine/Drummond's rush
- subalpine fir-whitebark pine/skunk leaved polemonium

Figure 1. Typical whitebark pine community in the Blue/Wallowa Mountain province; high elevation exposed ridge.

These communities are usually near timberline on exposed ridges and slopes. Most all of these sites have a component of subalpine fir; lodgepole pine is usually mixed in at the lower elevation range. Lodgepole and lodgepole pine/subalpine fir stands are often directly below these whitebark pine communities. Soils are shallow Inceptisols and growing seasons are short. Few of the whitebark pine areas in this province are easily accessible. Most of the whitebark pine is in designated Wilderness or sparsely-roaded high country (Figure 1).

These important communities provide habitat for associated fauna that inhabits the high country. Clark's nutcracker (Figure 2) has a rather amazing symbiotic relationship with whitebark pine. Pine seeds, which are heavy and wingless, are the preferred and often primary food source for the nutcracker and its young for a substantial portion of the year. Whitebark cones do not fully open and this pine species is dependent primarily upon this bird for seed dissemination. Whitebark pine seeds are large with high energy value, thus attractive to seed-eating birds. Orientation of cones maximizes visibility from the air, and scale morphology maximizes retention of the seed in the cone; allowing foraging nutcrackers plenty of time to collect seeds. The nutcracker will then cache seeds it collects in the soil for winter use (Lanner 1982). Caches that are not found essentially become planted seeds which can then germinate and grow. Seeds are often cached well away from where they are collected so nutcrackers also serve to disseminate these seeds for considerable distances. Moreover, nutcrackers prefer to cache seeds in open areas, especially recently-disturbed sites, and give the pine an

Figure 2. Clark's nutcracker

advantage as an early pioneering conifer (Tomback 1994). Thus, nutcrackers and their caches are the main means of reproduction of whitebark pine (Lanner 1982). Other birds and animals which inhabit this high country also will use seeds as a food source, including bears and red squirrels. Cover provided by pines in this often hostile environment is also used by resident birds and mammals.

Comments on the West-wide Situation

Managers have concerns that throughout the whitebark pine stand types in the west, most of these communities are seriously declining due to encroaching conifer competition; some are unable to develop regeneration, and many have been decimated by insects and disease, especially the introduced rust fungus, *Cronartium ribicola,* which causes blister rust of 5-needle pines and species of currents and gooseberries-*Ribes spp.* (Figures 3, 4; Dekker 1996). Blister rust is now found throughout most of the range of pine, and is severe in some of these areas. Mountain pine beetles (*Dendroctonus ponderosae*) have killed most of the large pine in some areas, and while large scale beetle-caused mortality may be a natural event, this species does not produce cones until it is at least 100 years old, and these older trees are the ones which are dead and dying. Coupled with all these factors, most whitebark pine communities are being impacted and some are in very serious trouble.

Figure 3. Whitebark pine infected with white pine blister rust (*Cronartium ribicola*).

The role of fire in these communities likely varies somewhat throughout the west-wide range of whitebark pine. In Montana, fire exclusion has been deemed extremely detrimental to the ecology of these communities, allowing shade tolerant conifers, especially subalpine fir, to become established and replace the pine. This is also a concern in our area, subalpine fir is the primary component that grows with whitebark in all but the upper elevation range, while lodgepole pine mixes into the lower portion of the range. Light ground fires which normally burned these higher slopes readily removed the fir component. Lodgepole pine is even less fire-tolerant than whitebark pine, so fire

Figure 4. Current (*Ribes spp.*) bush. This plant serves with five-needle pines to support *C. ribicola* through its complete life cycle.

played a positive role in the lower elevation range as well. Areas of stand replacement fires and other major disturbances are readily regenerated with whitebark due to the seed caching behavior of the nutcracker, allowing this pine a competitive advantage, especially at the higher elevations where lodgepole cannot become established.

Figure 5. Recent mountain pine beetle attacked whitebark pine in the foreground. Healthy lodgepole pine in the background.

SITES VISITED

MARBLE POINT

This area is at the crest of the Elkhorn Ridge accessed by the 6510 Road (T9S, R38E, sec. 15 and 22). Elevation at the saddle is 7542'. This is near Charlie Johnson's plot number 8501.

Subalpine fir and whitebark pine make up the stand composition near the top of the ridge. Lodgepole pine becomes dominant just a few hundred feet (in elevation) below the ridgetop. Whitebark pine on site include a range in ages and size classes from saplings through large relatively old trees. White pine blister rust is present and was considered very severe. Trees of all sizes were infected but the smaller trees were being killed faster. Larger trees had more flagging as mainly branches were being killed by the cankers. There was also evidence of rodent feeding on cankers; likely porcupine. The aeciospore masses on the edges of cankers are especially tasty to rodents, as feeding at these sites is not only common, it seems to attract animals from outside the area. From our experience with blister rust in white pine, canker formation is somewhat slower at these high elevation sites; infected trees take awhile to die. We found numerous red prickly current, *Ribes lacustre,* on-site which were loaded with orange telialhorns, meaning they were doing rather well fulfilling their role as an alternate host for *C. ribicola*.

Mountain pine beetle galleries were readily apparent on numerous large dead pine killed over a short period of time about 20 years ago. The mountain pine beetle epidemic was in full force at that time and was believed to have moved up the hill from the lodgepole pine hosts directly to the whitebark pine. We did not see any current or recent mountain pine beetle activity. Trees had been killed in clumps as well as in more scattered spaced trees. There is no evidence that blister rust predisposed trees to beetles, but rather, trees were rendered susceptible to attack by the epidemic population due to their age and size.

WESTERN UNION BASIN OVERLOOK

This area is at the crest of the Elkhorn Ridge and accessed by very steep mining roads. The site we visited is on and adjacent to the ridgetop overlooking Western Union Basin from the south (T8S, R37E, sec. 21). Elevation here is about 8000'. Charlie's plot number 8515 is nearby. This area is about 9 miles northwest of the previously described Marble Point area. The Elkhorn Crest Trail goes right through the area with whitebark pine stocking.

Blister rust was noted here but it was much lower in infection levels from what was observed at Marble Point. Only occasional flags were seen and little or no mortality was attributed to rust. *Ribes* was not found in or adjacent to the stand, but a few scattered plants were found near where the truck was parked; about 1/4 mile from the trail. No infection was found on plants. We believe that the lack of *Ribes* in the stand, and likely unfavorable wind patterns for spread, have minimized the amount of pine infection in this specific area.

Mountain pine beetle had killed numerous large trees here during the most recent (1970's) epidemic. We also found evidence of older mortality, probably from the 1910 outbreak. Without fire, pine snags and down wood will persist for at least one century at this high elevation. There is clear evidence that mountain pine beetle again was in the lodgepole pine at lower elevations at the same general time that the beetles killed many of the larger whitebark pine. We believe the mortality was a spill-over out of the lodgepole pine population, which is likely to have occurred regularly where lodgepole abuts against whitebark pine.

Strawberry Mountains--Ridge above Dead Horse Basin

Dead Horse Basin is in the east side of the Strawberry Wilderness. We found whitebark pine near 7800' (T15S, R34E, sec. 11). Access required a full days hike just to get in and out of this area so we did not spend very much time actually in the whitebark stand type. We were able to walk through some pine as well as to view a substantial amount of the area from this ridge, including plenty of acres of whitebark pine. Much of the whitebark pine we observed was mixed with lodgepole pine and subalpine fir. We suspect that forested communities may shift more to pure whitebark pine at higher elevations in the area that we were unable to visit.

We did not identify any blister rust in this area. We did find some prickly current that was apparently not infected with *C. ribicola* on the hike in, but not in the high elevation stands near the whitebark. Blister rust does occur in the north face of the Strawberrys', below the wilderness boundary, on western white pine.

There was at least some active mountain pine beetle observed in a few of the larger whitebark pine. Mountain pine beetle had been epidemic here in the late 1980's, most noticeably in the lower elevation lodgepole pine. We were able to see long distances to the north and older mortality (about 10 years old or more) was throughout these high elevation communities. We believe mortality included both lodgepole and whitebark pine and was the result of mountain pine beetle.

Mt. Russell Lookout

Mt. Russell Lookout is the most vehicle-accessible high point in the south Wallowas' (T20S, R46E, sec. 4). The conifer vegetation is dominated by subalpine fir and lodgepole pine with only a few scattered whitebark pine. These trees are small; mostly sapling size. Since the high point here is only 7487', this is likely just at the lower elevation range of this species.

Blister rust was not observed in the few whitebark pine we looked at. *Ribes* was not noted at this site either. Much of the lodgepole pine component in this area is mature and growing at relatively high densities, even so, there has not been significant mountain pine beetle activity in this area for a long time, and conditions favoring an outbreak currently exist.

Windy Saddle

This site is in Idaho near Windy Saddle Campground on the edge of the Hells Canyon Wilderness and on the 517 Road (T23N, R1W, sec. 7, BM). Elevation is 7600' at this exposed ridgetop site. Stocking is pure whitebark pine, and many trees average 10" diameter with a few old trees being 20" or more.

There currently is a mountain pine beetle outbreak occurring at this site. Boring frass was found around many of the larger trees at this location. All of these attacks have occurred this year, as crowns had not yet started to fade, but most likely will by next spring. We measured basal areas at several points and determined that stocking exceeds 200 $ft.^2$ per acre where trees are clumped. We found very some recent mountain pine beetle activity in the lower elevation stand dominated by lodgepole pine, but well within endemic levels. This activity did not seem to follow the perceived scenario of beetles building in adjacent stands of lodgepole and simply moving up the hill. Since stocking was excessive and numerous susceptible trees occur in this site, it is probable that beetle populations have increased simply because of the on-site conditions.

White pine blister rust is very severe throughout this area. Although *Ribes* plants were not noted on the site, they are common downslope. This is the probable source of

infection. Upslope wind patterns are likely to serve as efficient means of spore spread, especially under cool and moist conditions.

Seven Devils Lake and Goats Pass

This area was reviewed as we walked the trail from the campground at Seven Devils Lake up to the saddle at Goats Pass (T23N, R2W, secs. 12 and 13, BM). Elevation ranges from 7600 to nearly 8600'. Charlie's plot # 7077 is nearby.

There is a substantial mix of subalpine fir along with whitebark pine in these areas. Lodgepole pine becomes increasingly common in the low elevations, such as around the lake. There has been some recent mountain pine beetle activity in this lodgepole pine in recent years, as well as there being abundant evidence of old mortality. The whitebark pine has had little recent mortality, but there were plenty of older kills, probably dating back at least 20 years. Blister rust was observed in the whitebark pine along the trail, and moderate levels of infection were found in the pine at Goats Pass.

Sheep Creek

This site was accessed via trail after driving to the Sheep Creek Trailhead on the 39/100 Road southeast of Joseph. This area is within the Eagle Cap Wilderness (T4S, R45E, sec. 36) at about 7200'.

Conifers in the lower elevations are a mix of lodgepole pine and subalpine fir. In moving up in elevation well above Sheep Creek, white bark pine begins to appear and steadily increases as a stand component. Subalpine fir stocking persisted in this area along with the whitebark.

Blister rust was observed at rather light levels. This is a bit of a surprise because *Ribes* were fairly common at the lower elevations along Sheep Creek, including the smaller leaf prickly current (*R. lacustre*) as well as a riparian-dwelling larger leaf species (probably *R. viscosissimum*) that had abundant telial columns.

Mountain pine beetle activity was low to medium endemic in the lodgepole pine. The whitebark pine that we were able to observe was too small to be affected by beetles.

Top of Mt. Howard

This site was accessed via the tram (T3S, R43E, sec. 34). This is high country; the top of Mt. Howard is 8241'. Whitebark pine was observed from the gondola within the last several hundred feet in elevation to the top of the tram. Lodgepole pine again is mixed

in the lower elevation range and is dominant below the whitebark. This is a recreation area designed for short day hikes. Trails access the ridge system as will as the high elevation forest. There is a whitebark pine-dominated community at the top of the ridge with a minor component of subalpine fir. Many trees are small, although there are also scattered large and rather old whitebark pine. There was no evidence of mountain pine beetle in this community. Even the older dead did not have the characteristic and distinctive sapwood etching of this pine beetle. Some of these older dead pine had visible galleries of woodborers (Cerambycidae or Buprestidae) and these may have been secondary. There also appeared to be a species of *Ips* that was colonizing old killed tops.

White pine blister rust infection was very high. Numerous trees with cankers had rodent chewing which contributed to top-kill and dead branches. Prickly current (*R. lacustre*) was common here, providing an on-site source of infection. It was noted that blister rust was killing trees faster than they were being established. It is believed that this community will deteriorate over time due to the high mortality and poor recruitment of pine.

CONCLUSIONS

We have determined that blister rust occurs throughout northeastern Oregon/western Idaho with the exception of it not being confirmed in whitebark pine in the Strawberry Mountains. Western white pine is a minor component on the north face of the Strawberry's outside of the Wilderness boundary and we have observed blister rust in this area, so rust may occur in some of the Strawberry's whitebark, we've just not seen it.

Whitebark pine is reported on the Umatilla NF in the North Fork John Day Wilderness just north of the Vinegar Hill area. We did not look at this area.

Other conifer competition occurs throughout much of the lower- and mid-elevation ranges of whitebark pine. There is evidence that this has exasperated in the last few decades with the exclusion of fire. Regeneration in these areas is less likely to be pine but more likely to be fir. Blister rust, which is believed to have been here since the 1930's, is most likely to cause mortality to the smaller whitebark trees, again giving the other conifers a competitive advantage. Mountain pine beetles are most likely to kill the larger pines, with and without the population first building in lodgepole pine, although the later scenario may be infrequent. These larger and older trees are the only ones which produce seeds. It is our opinion that the combination of these factors is steadily shifting these communities away from their natural range of variability, and at least some of these areas are likely to loss their pine component in the future if current trends persist.

There are several things that can be done in the near future to assure that these degrading trends do not continue:

1. Plan for a more intensive inventory of the whitebark pine communities in the Blue Mountains and Wallowa-Snake Provinces. Include a more detailed analysis of plant succession and the ecological processes occurring as well as insect and disease activity and future risks. The expected products would be the identification of high priority treatment needs and possible cultural options, and hopefully, identification of rust-resistant individuals. There is potential to acquire Forest Health Protection Suppression/Prevention funding for work that specifically addresses suppression of blister rust or bark beetles activity. These funds are administered by the AFID (NR) shop in the Regional office.

2. Investigate the role of fire in these communities. Consider opportunities for prescribed natural fire.

3. Inventory the wildlife that are dependent upon these high elevation communities. If critical needs are identified, resources (funding) may be made readily available.

4. Determine what cultural techniques are available in reducing rust infection or resultant damage and how effective these would be.

- On-site *Ribes* seems to signify probability for high levels of rust infection. If eradication is done within priority high value stands, would infection be significantly reduced?

- Subalpine fir is an increasingly common cohort within whitebark pine communities. There are several reasons for prescribing cultural work to reduce this invading component. One proposed reason is the resulting modification of the microsite and possible reduction in rust infection potential. Such a study in western white pine failed to provide a positive response (Schwandt *et al.* 1994).

- Pruning of infections which would eventually be lethal due to proximity to the bole might be considered. Similarly, preventative thinning by removal of several whorls of the lower crown could be tested.

- Finally, there are probably resistant mechanisms in native populations of our whitebark. Identification and protection of individuals exhibiting evidence of resistance is highly recommended, as these are very valuable trees. This should be specifically done with regards to susceptibility to mountain pine beetle.

We hope information is informative and provides some ideas for future direction in protecting these valuable communities.

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